

Immunization Status of School Children in Buffalo, N.Y.

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IT IS EXTREMELY important for those concerned with protecting the health of the community to know the immunization status of its residents. The importance of immunization, plus current professional concern in determining its levels, has been emphasized by Goddard (1), who in a December 1964 lecture at an American Medical Association meeting in Portland, Oreg., drew attention to the following points:

1. Within the past year the American Medical Association has undertaken national campaigns to increase the use of smallpox vaccine and tetanus toxoid.

2. Thousands of local medical societies have joined in community programs for poliomyelitis immunization.

3. During 1962, a total of 444 cases of diphtheria, more than 17,000 cases of pertussis (whooping cough), and 322 cases of tetanus were reported.

Goddard said: "These facts indicate a continuing need to talk, not only to the public but to the profession, about immunization."

Determining the status of immunization among the population is difficult (2) owing to many factors. One is that immunizations are given over a fairly long period of a person's

life and more often than not are administered by more than one person or agency. Too, mothers, either disinclined toward immunization or unaware of its importance, fail to retain information concerning immunization on behalf of their children. Add to this the relatively rapid turnover of physician and clinic records and the mobility of the population in general, and the difficulties of recordkeeping and retrieval of accurate information become obvious.

To gain a fairly accurate knowledge of the status of the child population as well as the prevalent attitude concerning immunization, it seems that children entering school offer the best opportunity for a survey. A relatively short time has elapsed since they were immunized, and this information is usually available from physician or child health conference records. In New York State, immunizations are recorded on the birth certificate, and in the city of Buffalo, mothers are encouraged to follow this practice.

Method of Study

We selected six public schools in Buffalo for survey to determine the immunization status of children entering the first grade in 1963. The children were classified into high, middle, and low socioeconomic groups according to criteria set by the Erie County Health Department.

Information concerning the immunization status of all the children was obtained from

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the parents when the children were given a physical examination on entering school. Whenever possible, this information was obtained from birth certificates or from any other reliable record that the parents may have kept. Sometimes records for the children were obtained from private physicians or from child health conferences. Despite the relatively short time between administering the biologicals for diphtheria, tetanus, pertussis (DTP), and poliomyelitis during the first year of school and our request for the information, a great deal of time and effort often was expended by the public health nurses in obtaining the facts.

Results

The following criteria for completeness, adequacy, or inadequacy of protection were established for the study. (The schedule of immunizations recommended by the Erie County Health Department is listed under complete.)

Complete

DTP—Initial series of three injections at 2, 3, and 4 months; boosters at 13 months and at age on entering school.

Poliomyelitis—Initial series of three injections (or doses of oral vaccine) at 2, 3, and 4 months; boosters at 13 months and at age on entering school.

Smallpox—Vaccination at 4 months and at age on entering school.

Adequate

DTP—Initial series of three injections at 2, 3, and 4 months; one booster at 13 months or at age on entering school.

Poliomyelitis—Initial series of three injections (or doses of oral vaccine) at 2, 3, and 4 months; one booster at 13 months or at age on entering school.

Smallpox—Vaccination after infancy but within past 3 years.

Inadequate

DTP—Initial series of three injections or fewer.

Poliomyelitis—Initial series of three injections (or doses of oral vaccine) or fewer.

Smallpox—One vaccination in infancy or none at all.

Table 1 gives the number and percent of children who were found to be completely, adequately, or inadequately protected against these diseases. All three socioeconomic groups were more than 70 percent protected against DTP, which is the commonly accepted community goal. Only the high socioeconomic group attained 80 percent (usual community goal) protection against poliomyelitis. If a series of three injections plus one booster were set as adequate protection against poliomyelitis, and five injections as complete protection, many people would accept the series of three injections as only partially adequate protection. If we had included the children who had three injections with those in the "adequate" group, the middle socioeconomic group then would have attained 80 percent protection, but the low socioeconomic group would have remained below this level.

A clear-cut correlation also exists between socioeconomic group and completeness and adequacy of protection against DTP and poliomyelitis. Children in the high socioeconomic group were better protected than children in the middle socioeconomic group; and children in the low socioeconomic group had the least protection. The relation between socioeconomic group and level of immunization has been emphasized in more than 100 surveys conducted since 1958 (3), and our findings confirm the consensus that the lower the socioeconomic group, the poorer the level of immunization. The largest single group of children were those considered to be adequately immunized against DTP and poliomyelitis. Most of these children had received their one and only booster dose in school, which emphasizes the importance of the school immunization program.

The correlation between adequacy of protection against smallpox and socioeconomic group is not as clearcut as for poliomyelitis and DTP. The low socioeconomic group again shows the least adequate protection, but by a very small margin compared with the high socioeconomic group. All three socioeconomic groups reached the accepted 70 percent protection, but only after vaccination on entrance to school. Table

Table 1. Number and percent of children immunized after entering six Buffalo, N.Y., public schools, 1963

Type of immunization and socioeconomic group	Number of children	Complete		Adequate		Inadequate	
		Number	Percent	Number	Percent	Number	Percent
Diphtheria, tetanus, pertussis...	345	44	13	227	66	74	21
High.....	100	14	14	73	73	13	13
Middle.....	116	14	12	81	70	21	18
Low.....	129	16	12	73	57	40	31
Poliomyelitis.....	345	65	19	194	56	86	25
High.....	100	17	17	66	66	17	17
Middle.....	116	17	15	68	58	31	27
Low.....	129	31	24	60	47	38	29
Smallpox.....	345	125	36	151	44	69	20
High.....	100	40	40	38	38	22	22
Middle.....	116	47	40	55	47	14	13
Low.....	129	38	30	58	45	33	25

2 shows the number of children who were adequately immunized and vaccinated as a result of the boosters received at school.

Comparisons and Trends

The levels of immunization found in our cohort are reassuring. However, apart from emphasizing the importance of the school immunization program in terms of boosters, maintenance of protection, and establishment of immunity against smallpox, important factors such as the source of the initial series, trends in immunization levels, and so on were missing.

We were fortunate in having unpublished information available concerning the immunization status of a cohort of children entering the

Buffalo city schools in 1953. This information was gleaned as part of a wider survey of the immunization status of the city of Buffalo. Six schools were included: two in the high, two in the average, and two in the low socioeconomic groups. Socioeconomic status was based on the standard criteria we used in the 1963 study. Data on the immunization levels for children entering these schools were collected from the parents by the school nurse, on a form prepared by one of the authors (W.W.) specifically for the purpose.

In 1953 separate antigens were used for DTP; therefore, two sets of figures were available for this immunization series. The criteria for adequate protection against DTP was set as the initial series of antigen, for it was assumed that these children would receive boosters after entrance to school, thus bringing their antibodies to satisfactory levels. Unfortunately, information was not obtained on the percentage of children who received a booster 1 year after the initial series. Thus we had no comparison figures for the 1963 group of children who were assessed as being completely immunized after they had received two boosters. To ascertain the trend, we compared the 1953 group of adequately immunized children with the 1963 groups of adequately and completely immunized children. The total number of children enter-

Table 2. Number of children receiving adequate immunization through school program, Buffalo, N.Y., 1963

Socioeconomic group	Total	DTP ¹	Polio-myelitis	Small-pox
High.....	100	67	57	78
Middle.....	116	74	57	102
Low.....	129	65	58	96
Total....	345	206	172	276

¹ Diphtheria, tetanus, pertussis.

ing school in 1953, by socioeconomic group, as well as the number and percentage of children who were considered to be adequately or inadequately immunized against diphtheria, tetanus, whooping cough, and smallpox are given in table 3.

Three factors are immediately apparent when comparing the 1953 figures with the 1963 figures.

1. The relation between socioeconomic status and adequacy of immunization for the 1963 cohort is the same for the 1953 cohort.

2. While the levels of adequacy and inadequacy of protection against DTP are pretty much the same for 1953 and 1963, a marked improvement is seen in the adequacy of immunization against whooping cough for the 1963 cohort, undoubtedly due solely to the use of the triple antigen.

3. The 1963 figures for smallpox (table 1) show that most children in the adequate group received the vaccination qualifying them for inclusion in this group on entrance to school.

In 1953, adequate protection against smallpox was defined as one vaccination before entering school; therefore, for comparison with the 1963 figures, only those children in the completely protected group, that is, those who received a vaccination before entering school, could be compared with the adequately protected group for 1953 (table 3). This shows that fewer vaccinations were given in the high and middle socioeconomic groups during the infant and preschool years, while the number in the low socioeconomic group remained the same. Therefore, if it were not for the school immunization program, between 60 and 70 percent of

children in the three socioeconomic groups in 1963 would have been unprotected against smallpox. This is surely a matter of concern.

Discussion

Levels of immunity to diphtheria and tetanus in school children in the city of Buffalo have remained essentially the same over a 10-year period. The improved levels of protection against whooping cough during the same period are considered to be due entirely to the use of triple antigen. The level of protection against smallpox in children in the preschool years was low in 1953 and decreased over the 10-year period. This demonstrates the need for continued education on the importance of immunization against smallpox. The school program raised the levels of immunity against smallpox and DTP to more than 70 percent, which demonstrates the value of the program, if not its indispensability, in maintaining adequate levels of immunization in the population.

Despite the forms given to the parents, the records kept by physicians and clinics, the recording of information on birth certificates, and other methods of recordkeeping, the difficulties of retrieving this information make it necessary for those engaged in maintaining the health of the public to turn their attention and effort toward finding better means of recording and subsequently retrieving such data. Perhaps the time is ripe for establishing record-linkage systems and central files such as described by Newcombe (4) and Acheson (5, 6).

The cost of initiating such a system could be more than balanced by the professional time

Table 3. Number of children¹ adequately immunized against diphtheria, tetanus, pertussis, and smallpox, Buffalo, N.Y., 1953

Socioeconomic group	Number of children	Diphtheria and tetanus		Pertussis		Smallpox	
		Number	Percent	Number	Percent	Number	Percent
High.....	209	190	91	179	86	117	56
Middle.....	204	170	83	124	61	136	67
Low.....	131	88	67	60	46	41	31
Total.....	544	448	82	363	67	294	54

¹ Entering first grade, 6 public schools.

currently expended in trying to obtain the information. Is it not time we asked ourselves for what purpose immunization and other records are kept if over a period of years this information is lost and therefore is unavailable to the person immunized as well as to the investigator? Unless we make a concerted effort to build and maintain efficient recordkeeping systems, many of our present efforts on behalf of public health may be wasted.

Summary

Because artificially induced immunity can alter community and personal susceptibility to disease, knowledge of the immunization status of the population is important. Children entering school offer a good opportunity for study. A sampling by the Erie County Health Department of children entering six city of Buffalo public schools in 1963 showed that they were adequately immunized against diphtheria, tetanus, whooping cough, and poliomyelitis, but inadequately protected against smallpox.

The school immunization program is an effective means of establishing immunity against smallpox and of maintaining immunity against diphtheria, whooping cough, tetanus, and poliomyelitis. Comparison of the cohorts of children who entered six Buffalo public schools in

1953 and 1963 showed that for diphtheria and tetanus the level of protection remained about the same. Protection against whooping cough increased, but protection against smallpox decreased. The decreased protection against smallpox is a matter of concern and reveals the need for public education. A matter of equal concern is the difficulty encountered in obtaining information on the immunization status of each child. Central files and record-linkage systems are suggested for improved record-keeping.

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Division of Federal Employee Occupational Health and Safety

A Division of Federal Employee Occupational Health and Safety to promote and provide employee health services for Federal employees has been established by the Public Health Service. Protection of the worker against health risks inherent in his occupation and enhancement of productivity by promotion of health will be stressed.

In addition, the division will be responsible for developing and augmenting an improved safety control program for Service facilities. The division combines the work of the Federal Employee Health Program, which was in the Division of Hospitals, and the Safety and Fire Prevention Section, which was in the Office of the Surgeon General. Part of the Service's Bureau of Medical Services, it is headed by Dr. Gordon S. Siegel, a Service career officer.



Studies on Electroconvulsive Therapy, 1939-1963. A selected annotated bibliography. National Clearinghouse for Mental Health Information. PHS Publication No. 1447 (*Public Health Bibliography Series No. 64*); 1966; by Miriam R. Geller; 413 pages; \$2. Composed of controlled and comparative studies published between 1939 and 1963. Includes clinical, biochemical, physiological, and psychological studies of both humans and animals when the study was designed to investigate the use of electroconvulsive treatment in psychiatry, or when its results were relevant to such treatment. Arranged by author and indexed by author and subject, the annotations are intended to be factual summaries of the author's methodology and results are not evaluative or critical.

Occupational Health Nurses: An initial survey. PHS Publication No. 1470; by Mary Lou Bauer and Mary Louise Brown; 1966; 150 pages. Provides descriptive data on characteristics of occupational health nurses—who they are, where they work, what they do, and how they are supervised. Analyzes data in terms of regional distribution of nurses, the size of workplace and major industry group in which they are employed, and the nurses' present positions in the health unit. Findings will be useful in projecting the future need for nurses to staff programs, for projecting future need for training, and for measuring future change in occupational health nursing.

Emergency Health Preparedness Publications Catalog. PHS Publication No. 1071-A-1; 1966; 40 pages. Lists 86 currently available publications which are specifically related to emergency health preparedness activities. Includes publications produced by other government and non-government sources. Provides de-

scription of contents, cost, and address of publisher for each entry. Groups publications under the following subject categories: emergency health service planning, environmental health, medical care and treatment, training, health resources and evaluation, packaged disaster hospitals, health facilities, supplies and equipment, health manpower, public water supply, and catalogs and bibliographies.

To Improve Medical Care. A guide to Federal financial aid for the development of medical care services, facilities, personnel. Revised 1966; 96 pages; 40 cents.

Gives summary information on about 60 aid programs of the Department of Health, Education, and Welfare and 15 programs of other Federal Government agencies. Outlines the purpose of each program, the funding in fiscal years 1965 and 1966, who may receive the aid, and where further information may be obtained. Also presents summary information on the Medicare programs and the new expanded Medical Assistance Program (Title XIX).

The publication, in pocketbook format, is intended as a guide to Federal grants and other financial aid now available to help States, communities, hospitals, nursing homes, medical schools, and other public and private agencies to strengthen medical care services.

Mental Health of Children. The child program of the National Institute of Mental Health. PHS Publication No. 1396; December 1965; 65 pages; 40 cents.

Describes the efforts to provide better mental health for children. Discusses the National Institute of Mental Health activities designed to provide techniques, knowledge, and services that can help reverse the rising tide of emotional disturbance

in children and enhance the well-being and productivity of all youth. Describes NIMH programs in the areas of the child in normal environment, early help for disturbed children, and intensive care and treatment necessary for rehabilitation. Discusses the role of the community mental health center and the programs for training personnel in child mental health.

The report also gives findings in family therapy, education for emotionally disturbed children, social forces in delinquency, the effect on normal children of being reared in various types of institutions, hospitalization for disturbed children and adolescents, treating families of delinquent boys, and evaluating community-based treatment for delinquents.

Chronic Respiratory Diseases. A growing menace. PHS Publication No. 1445; May 1966; 12 pages. Describes the growing significance of chronic respiratory diseases, such as emphysema and chronic bronchitis, and the lack of adequate treatment and care of victims of these diseases. Outlines the responsibilities and functions of the newly created chronic respiratory disease program of the Division of Chronic Diseases which was designed to demonstrate the effectiveness of existing medical technology and speed the translation of knowledge into action programs for early detection, treatment, and rehabilitation of patients with chronic respiratory diseases.

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